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TECHNOLOGY ADOPTION INDEX AND ITS CONSTRAINTS FACED BY THE FARMERS TO COPE WITH AGRICULTURAL RISKS; EMPIRICAL EVIDENCE FROM TAMIL NADU

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ABSTRACT

Production risk is the major risk faced by the farmers and it arises from uncertain consequences of events which negatively affects yield. Risk coping strategies are decisions and actions taken ex post after the risky event has occurred. Technology plays a significant role in production risk faced by farmers and technology adoption is one of the important coping strategies to reduce the impact of risk in production. The present study was conducted in Krishnagiri and Ramanathapuram districts of Tamil Nadu. Overall objective of the study was to identify the technology components and constraints faced by the farmers in study area. The results revealed that co-efficient of variation in adoption of individual technology components indicated that the variation in the adoption of Plant protection chemical (81.03 per cent) was less, while high variation was exhibited in the adoption of water management practices (262.48 per cent). Based on technology adoption index 45.56 per cent respondents were less adopter, 35 per cent were medium adopter and 19.44 per cent were high adopters. Response Priority Index indicated that lack of finance and credit facilities was given maximum priority in adopting technologies to cope risks in agricultural practices and ranked first with a mean score of 0.71.

KEYWORDS: Technology Components, Technology Adoption Index & Responses Priority Index

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INTRODUCTION

Risk is a central issue that affects different aspects of people's livelihood in the developing world. Peter Bernstein, in his best-selling book, "*Against the Gods, the Remarkable Story of Risk"*, reminds us that the word "risk" was derived from the early Italian word *risicare*, which means "to dare." In this context the word risk implies an element of choice and is more action-oriented, which is as it should be. Risk is seen as an important and ever present factor influencing the optimizing behavior of farm adjusting to disequilibria in agriculture. It is manifested in the production process in two ways. One, it affects the level of output by influencing the levels of inputs used and second, it constrains the farm from realizing the full potential of the technology by influencing it not to follow the best method of input application. The former may be described as market (Allocative) risk and the latter as production (technical) risk. Farming in India is with risk and uncertainty. Production risk is the major risk faced by the farmers and it arises from uncertain consequences of events connected to weather which negatively affects yield. Production risk is not only weather related but is also related to technology. Technology plays a significant role in production risk faced by farmers. The introduction and adoption of new technologies such as new crop varieties, chemicals, and techniques though provides a greater potential to enhance efficiency in production, they may not necessarily produce the expected results more significantly in the short run (Viatte, 2001).

Successful farmers are those who can identify these risks and adopt appropriate strategies to manage them. Farmers adopt various risk management strategies in response to the risks they face. Several strategies can be used by the agricultural sector to manage risk. Although the various risk management strategies are conceptually plausible, the onus of risk management rests on farmers to select the particular combination of risk management strategies that suit the distinctive characteristics of their farm. The variety of management strategies adopted by farmers is controlled by their appreciation of the risk involved, ability to manage risk, and their relative risk aversion (Martin and Shadbolt, 2000). Risk coping strategies are decisions and actions taken ex post after the risky event has occurred. While the distinction between risk management and risk coping strategies is very useful from a theoretical perspective, its importance is less crucial from a practical point of view. These risk management strategies may include decisions on-farm, changes in portfolio structure, use of market instruments, government programs, and diversification to other source of income. The overall objective of the study was to identify the technology components and constraints faced by the farmers in study area.

MATERIALS AND METHODS

Based on vulnerability score districts in Tamil Nadu state were arranged in a chronological order and Krishnagiri and Ramanathapuram districts were randomly selected for the present study. Ninety samples from each district were selected and thus the total sample size was 180. The results were analysed and tabulated with the help of following methodologies.

TECHNOLOGY ADOPTION INDEX

Technology adoption is one of the important coping strategies to reduce the impact of risk in production. But, one of the important issues with regard to technologies is adoption of technologies generated by the State Agricultural Universities (SAUs). When such a technology is followed more or less permanently or over a long period in response to recurring risk, it becomes technology adaptation. Adaptation is the response to reduce risks by moderating the potential damages.

An adoption index was constructed to quantify the adoption of such technologies:

Adoption Index = [a/p]* 100

where,

a = Number of practices adopted by respondents, and

p = Total number of practices recommended.

The respondents were classified as adopters if the adoption index was 50 or above. The recommended practices for crop production are given in the 'Package of Practices' approved by the State Department of Agriculture in consultation with the Tamil Nadu Agricultural University.

RESPONSES PRIORITY INDEX (RPI)

To assess the constraints uttered by the farmers in adoption of technologies to cope with risks in agricultural practices, there was a problem, whether importance be supposed to be given for the number of answers to a particular main concern or to the maximum number of answers to a constraint in the first priority. To determine this, a Responses Priority Index (RPI) was built as a creation of Proportion of Responses (PR) and Priority Estimate (PE), where PR for the i^{th} constraint gives the ratio of number of responses for a particular constraint to the total responses as per equation (Rao, 2011):

$$(RPI)_i = \frac{\sum_{j=1}^{k} f_{ij} X_{[(k+1)-j]}}{\sum_{i=1}^{1} \sum_{j=1}^{k} f_{ij}} 0 \leq RPI \geq 5$$

Where,

RPI_i = Response Priority Index for i^{th} constraint

f_{ij}= Number of responses for the j^{th} priority of the i^{th} constraint (I=1, 2…, l; j= 1,2,3….. k)

$\sum_{j=1}^{k} f_{ij}$= Total number of responses for the i^{th} constraint

k = Number of priorities (1. Strongly agree; 2. Agree; 3. Moderate; 4. Disagree and 5. Strongly disagree)

$X_{[(k+1)-j]}$= Scores for the j^{th} priority

$\sum_{i=1}^{1} \sum_{j=1}^{k} f_{ij}$= Total number of responses to all constraints

In the present study, larger the RPI, higher would be the importance for that constraint. In the present study, the following constraints were identified (1. Lack of finance and credit facilities; 2. More expensive; 3. Lack of knowledge about technology; 4. Lack of technical skill; 5. Inadequate training and demonstration and 6. Inadequate size of land holdings for the adoption).

RESULTS AND DISCUSSIONS

Technology Adoption Index

There are several strategies to cope with risks in agricultural production and technology adoption is one of the important strategies to reduce the impact of agricultural production risk. The State Department of Agriculture and the Tamil Nadu Agricultural University have released a package of practices for crop production. These practices include among other recommendations, technologies to cope up with agricultural production risk.

Table 1: Components of Technology Adoption among Sample Respondents

Sl. No.	Technology Component	Percentage of Adoption	Co-efficient Variation (%)
1.	Disc ploughing	60.83	196.85
2.	Summer ploughing	54.16	172.75
3.	High yielding variety	77.5	96.47
4.	Seed rate	89.16	86.12
5.	Seed Treatment	45.83	240.44
6.	Plant protection chemical	86.66	81.03
7.	Pre-monsoon sowing	60.33	176.97
8.	Farmyard manure	58.66	178.62
9.	Chemical fertilizer N:P:K	82.83	101.43
10.	Water management practices	43.33	262.48

It could be seen from Table 1, the co-efficient of variation of adoption of individual technology components indicated that the variation in the adoption of Plant protection chemical (81.03 per cent) and seed rate (86.12 per cent) was less, while high variation was exhibited in the adoption of water management practices (262.48 per cent) and seed treatment (240.44 per cent). The results indicated that seed rate (89.16 per cent), plant protection chemical (86.66 per cent) and Chemical fertilizer N: P: K (82.83 per cent) was the important technology component adopted by farmers in the study area.

Table 2: Adoption Level of Sample Farmers based on Technology Adoption Index

Sl. No.	Adoption Level based on TAI	Frequency of Farmers	Percentage to Total
1	Less (>50 per cent)	82	45.56
2	Medium (50-70 per cent)	63	35.00
3	High (<70 per cent)	35	19.44
	Total	**180**	**100.00**

Adoption of technology was quantified by constructing a technology adoption index and results are furnished in *Table 3*. The respondents were classified as less adopter (below 50 per cent), medium adopter (50 to 70 per cent) and high adopter (more than 70 per cent) based on technology adoption index. It is revealed from table that 45.56 per cent respondents were less adopter, 35 per cent were medium adopter and 19.44 per cent were high adopters.

RESPONSES PRIORITY INDEX (RPI)

An effort was made to find out the constraints faced by the farmers in adopting technologies to cope with risk factors and ranks were given based on Response priority index. The outcome of the study are given in table 3.

Table 3: Constraints Faced by the Sample Farmers in Adoption of Technology Components

Sl. No.	Constraints	Individual Priorities (Number)					Total (No.)	RPI	Rank
		I	II	III	IV	V			
1	Lack of finance and credit facilities	92	53	22	11	2	180	0.71	I
2	More expensive	52	76	48	2	2	180	0.66	II
3	Inadequate size of land holdings for the adoption	46	56	52	22	4	180	0.61	III
4	Lack of knowledge about technology	38	30	76	24	12	180	0.55	IV
5	Lack of technical skill	2	6	68	84	20	180	0.39	V
6	Inadequate training and demonstration	1	5	46	80	48	180	0.34	VI
	Total						**1080**		

From Table 3, the Response Priority Index indicated that lack of finance and credit facilities was given maximum priority in adopting technologies to cope risks in agricultural practices and ranked first with a mean score of 0.71 followed by more expensive (0.66), inadequate size of land holdings for the adoption (0.61), lack of knowledge about technology (0.55). Lack of technical skill (0.39) and inadequate training and demonstration (0.34) were the minor problems observed of least significance. This finding was consistent to that of Rao (2011) and Archana *et al.* (2019).

CONCLUSIONS

The study revealed that farmers in the study area, generally have not taken up seed treatment and this may be due to lack of awareness. Hence, efforts are needed on the part of extension agencies to popularise seed treatment among farmers. The application of farmyard manure was very low as compared to the recommended quantity and this may be due to the lack of availability of this input in villages. But, application of organic manure is essential to maintain the productivity of the soil on a sustainable basis. Hence, farmers may be trained to produce compost using farm waste and other organic-materials available locally. Technology Adoption Index indicated that most of the farmers were less adopter category and very low percentage of the farmers follows most of the technologies available to cope with agricultural risk. Response Priority Index indicated that lack of finance and credit facilities was given maximum priority in adopting technologies to cope risks in agricultural practices and ranked first and inadequate training and demonstration was the minor problems observed of least significance.

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